[Specification]

[Title of the Invention]

METHOD FOR DRIVING PLASMA DISPLAY PANEL

[Brief Description of the Drawings]

The above and other objects, features and advantages of the present invention will be apparent from the following detailed description of the preferred embodiments of the invention in conjunction with the accompanying drawings, in which:

FIG.1 illustrates the construction of a conventional AC surface discharge PDP;

FIG. 2 illustrates the arrangement of electrodes for driving a PDP;

FIG. 3 illustrates a sub field structure of an address-display separated (ADC) driving method;

FIG. 4 illustrates a PDP having a structure in which an address electrode is divided into two parts;

FIG. 5 illustrates a scanning sequence in a conventional PDP driving method;

FIG. 6 illustrates a scanning sequence in a conventional method for driving a PDP having a structure in which address electrodes are divided into two parts;

FIG. 7 illustrates a scanning sequence in a PDP driving method according to the present invention;

FIG. 8 illustrates a scanning sequence in a method for driving a PDP having a structure in which address electrodes are divided into two parts according to the present invention; and

FIG. 9 illustrates another scanning sequence in the method for driving a PDP having a structure in which address electrodes are divided into two parts according to the present invention.

[Explanation on Main Parts of the Drawings]

1: front glass substrate	2: a rear glass substrate
3: address electrode	4: barrier rib
5: phosphor	6: dielectric layer
7: X-electrode	8: Y-electrode

【Detailed Description of the Invention】

【Object of the Invention】

【Technical Field to which the Invention pertains and Its related Art】

The present invention relates to a method for driving a plasma display panel (PDP) and, more particularly, to a method for driving a PDP, which prevents abnormal discharging and dielectric breakdown caused by surplus charged ionizing particles accumulated outside a display area.

FIG. 1 illustrates the construction of a conventional AC surface discharge PDP. Referring to FIG. 1, the AC surface discharge PDP includes a front glass substrate 1, an address

electrode 3 formed on the front glass substrate 1, a rear glass substrate 2 opposite to the front glass substrate 1, an X-electrode 7 and a Y-electrode 8 arranged in parallel with each other on the rear glass substrate 2, a dielectric layer 6 for covering the X-electrode 7 and the Y-electrode 8, a MgO protective layer formed on the dielectric layer 6, and a barrier rib 4 arranged between the front and rear glass substrates 1 and 2 to define a discharge space.

FIG. 2 illustrates the arrangement of driving electrodes of the PDP of FIG. 1. As shown in FIG. 2, a plurality of address electrodes A1 to A_M are arranged in parallel, and a plurality of X-electrodes and Y-electrodes Y1 to Y_N are arranged intersecting the address electrodes. Discharge cells are respectively formed at the intersections of the X-electrodes and Y-electrodes and the address electrodes. The Y-electrodes are scan electrodes and the X-electrodes are commonly connected to serve as a common electrode.

FIG. 3 illustrates an address-display separated (ADS) driving method for driving the PDP shown in FIGS. 1 and 2. Referring to FIG. 3, one field of a video signal is divided into eight sub-fields. Each of the eight sub-fields includes an overall write period (reset period), an address period and a sustain period. The reset period discharges every discharge cell of FIG. 2 to initialize it. The address period selects discharge

cells to be displayed in response to an input video signal. The sustain period sustains discharging in the discharge cells selected by the address period. The sustain period of each sub field is given a weight as a display period. The sub-fields are combined to represent multiple gray scales.

In general, the scan lines Y1 to Y_N of the PDP of FIG. 2 include 480 lines in the case of VGA, and an addressing operation is carried out in such a manner that scanning is executed by a line alternating method and a data signal is supplied through the address electrodes. In the ADS driving method in which one image field is divided into eight sub-fields and each sub field has an address period for every scan line, as shown in FIG. 3, a scan period for one scan line is approximately 2.5μs. Thus, a period required for scanning one image field corresponds to 2.5μs×480×8=9.6ms. Here, 480 means the number of scan lines and 8 means the number of the sub-fields. When one image field is approximately 16.7ms, the period required for scanning one image field is 9.6ms so that the remaining time of the one image filed period, that is, 7.1ms, is used for gray scale representation. However, when the number of sub-fields is increased to ten in order to eliminate false contour or increase the number of gray scales, the period required for scanning one image field becomes 2.5μ×480×10=12ms so that the time used for representing gray scales is at most 4.7ms. Accordingly, the gray scales should be

represented at a very high frequency. Furthermore, when scan lines more than 760 are used for an HD-TV, the scanning time reaches 2.5μ×760×8=15.2ms and thus most of one image field period is used for the scanning time.

To solve this problem, a method of dividing an address electrode into two parts and dual-scanning two parts, as shown in FIG. 4, is used. This method can reduce the scanning time by half to use a larger number of sub-fields although a larger number of driving ICs are required. Furthermore, this method can be applied to an HD-TV having scan lines more than 760.

FIG. 5 illustrates a scanning sequence in a conventional PDP driving method. A scanning operation is executed in such a manner that a scan pulse is sequentially applied to the first to four-hundred-eightieth scan electrode (Y-electrodes) lines for each sub field and, simultaneously, an input video data pulse is applied to an address electrode. Here, when the scanning operation is repeatedly carried out, surplus charged ionizing particles are accumulated or lost at a region surrounding a display area adjacent to the last scan electrode line, that is, the four-hundred-eightieth scan electrode line, to increase or decrease a potential. This causes abnormal discharge in cells located in proximity to the four-hundred-eightieth scan electrode line to thereby decrease picture quality or generate dielectric

breakdown, which results in deterioration in the reliability of PDP.

FIG. 6 illustrates a scanning sequence in the conventional method that divides an address electrode into upper and lower parts to drive a PDP. When the first to two-hundred-fortieth scan lines are addressed and the two-hundred-forty-first to forty-eightieth lines are addressed, for example, charges are abnormally accumulated at the center of the address electrode, that is, the boundary of the upper and lower parts of the address electrode, and a region surrounding a display area to increase a potential. This causes abnormal discharge in cells disposed in proximity to the forty-eightieth scan electrode line to thereby decrease picture quality or generate dielectric breakdown, resulting in deterioration in the reliability of PDP.

【Technical Purpose to be Achieved by the Invention】

Accordingly, the present invention has been made in view of the above problems occurring in the prior art, and it is an object of the present invention is to provide a method for driving a PDP, which prevents abnormal discharge or dielectric breakdown caused by charged ionizing particles accumulated or lost in a region outside a display area of the PDP.

Another object of the present invention is to provide a method for driving a PDP, which presents abnormal discharge or

dielectric breakdown generated at the boundary of divided two parts of a PDP driven by the address electrode-divided driving method.

【Configuration and Operation of the Invention】

To accomplish the objects of the present invention, according to one aspect of the present invention, there is provided a method for driving a plasma display panel (PDP) including a pair of substrates arranged having a predetermined distance therebetween, a plurality of address electrodes formed on one of the substrates, and N scan electrodes formed on the other substrate to intersect the address electrodes. One field of an input video signal is divided into a plurality of sub-fields respectively having luminance weights. Each of the sub-fields includes an address period during which a scan pulse is sequentially applied to the N scan electrodes and, simultaneously, an input video data signal pulse is applied to the address electrodes to select cells to be displayed and a sustain discharge period during which a sustain discharge pulse is applied to the selected cells in response to the luminance weights of corresponding sub-field. The plurality of sub-fields include sub-fields having an address period during which the scan pulse is sequentially applied to the first to the Nth scan electrodes and sub-fields having an address period during which the scan pulse is sequentially applied to the Nth to the first scan electrodes.

Preferably, the sub-fields having an address period during which the scan pulse is sequentially applied to the first to the Nth scan electrodes are odd-numbered sub-fields, and the sub-fields having an address period during which the scan pulse is sequentially applied to the Nth to the first scan electrodes are even-numbered sub-fields.

According to another aspect of the present invention, there is also provided a method for driving a plasma display panel (PDP) including a pair of substrates arranged having a predetermined distance therebetween, a plurality of address electrodes formed on one of the substrates and divided into upper and lower parts, and N scan electrodes formed on the other substrate to intersect the address electrodes. One field of an input video signal is divided into a plurality of sub-fields respectively having luminance weights. Each of the sub-fields includes an address period during which a scan pulse is sequentially applied to N/2 scan electrodes intersecting the upper or lower address electrodes and, simultaneously, an input video data signal pulse is applied to the upper or lower address electrodes to select cells to be displayed and a sustain discharge period during which a sustain discharge pulse is applied to the selected cells in response to the luminance weights of corresponding sub-fields. The plurality of sub-fields include sub-fields having an address period during which the scan

pulse is sequentially applied to the first to the (N/2)th scan electrodes or the (N/2+1)th to the Nth scan electrodes and sub-fields having an address period during which the scan pulse is sequentially applied to the Nth to the (N/2+1)th scan electrodes or the (N/2)th to the first scan electrodes.

Preferably, the sub-fields having an address period during which the scan pulse is sequentially applied to the first to the (N/2)th scan electrodes or the (N/2+1)th to the Nth scan electrodes are off-numbered sub-fields, and the sub-fields having an address period during which the scan pulse is sequentially applied to the Nth to the (N/2+1)th scan electrodes or the (N/2)th to the first scan electrodes are even-numbered sub-fields.

Preferably, in each sub field, the scan pulse is sequentially applied to the first to the (N/2)th scan electrodes intersecting the upper address electrodes, and the scan pulse is sequentially applied to the Nth to the (N/2+1)th scan electrodes intersecting the lower address electrodes.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

An ADS driving method for driving a PDP according to the present invention will be explained hereinafter with reference to FIG. 5. One field of a video signal, which corresponds to approximately 16.67ms, is divided into eight sub-fields. Each of

the sub-fields includes a reset period, an address period and a sustain period. In the reset period, a voltage of approximately 350V, which is larger than a sustain voltage, is applied to equalize a discharge condition of every discharge cell.

In the address period, a scan pulse is sequentially applied to a plurality of scan electrodes (Y-electrodes in FIG. 2) and, simultaneously, an input video data signal is applied to address electrodes to select discharge cells to be displayed. During the address period for selecting the discharge cells to be displayed, the scan pulse is applied to the scan electrodes and a data pulse is applied to the address electrodes to generate an address discharge and thus spatial charged particles are generated and wall charges are accumulated on a dielectric layer for covering the scan electrodes (referring to FIG. 1). Subsequently, a sustain pulse is alternately applied to the scan electrodes and a common sustain electrode in the sustain period such that the sustain pulse is added to the accumulated wall charges to generate a sustain discharge. The sustain discharge does not occur in a cell in which wall charges are not accumulated (a cell that is not provided with data so that it is not selected) only with the sustain pulse. This function is a memory function or selecting function of a cell to be displayed.

Referring to FIG. 7, the PDP driving method of the present invention sequentially applies the scan pulse to the first to the

four-hundred-eightieth scan electrode lines for the first, third, fifth and seventh sub-fields and sequentially applies the scan pulse to the four-hundred-eightieth to the first scan electrode lines for the second, fourth, sixth and eighth sub-fields. In this case, the polity of surplus charged ionizing particles generated outside the four-hundred-eightieth scan electrode line in odd-numbered sub-fields is opposite to the polarity of charged ionizing particles generated by address discharge of the four-hundred-eightieth scan electrode line in even-numbered sub-fields. Thus, finally accumulated surplus charged ionizing particles can be reduced or removed. Consequently, abnormal discharge or dielectric breakdown in discharge cells disposed in proximity to the four-hundred-eightieth scan electrode line can be prevented by reducing or removing the surplus charged ionizing particles.

FIG. 8 illustrates a scanning sequence in the method for driving a PDP having a structure in which address electrodes are divided into two parts for driving the PDP according to the present invention. Referring to FIG. 8, a scan pulse is sequentially applied to the first to the two-hundred-fortieth scan electrode lines intersecting an upper address electrode part or the two-hundred-forty-first to the four-hundred-eightieth scan electrode lines intersecting a lower address electrode part for the first, third, fifth and seventh sub-fields, and the scan pulse is sequentially applied to the two-hundred-fortieth to the

first scan electrode lines intersecting the upper address electrode part or the four-hundred-eightieth to the two-hundred-forty-first scan electrode lines intersecting the lower address electrode part for the second, fourth, sixth and eighth sub-fields. In this case, the polarity of surplus charged ionizing particles generated at the boundary of the upper and lower address electrode parts becomes opposite to the polarity of charged ionizing particles generated by address discharge at the boundary of the upper and lower address electrode parts. Thus, finally accumulated surplus charged ionizing particles can be reduced or removed. Consequently, abnormal discharge or dielectric breakdown in discharge cells disposed in proximity to the boundary of the upper and lower address electrodes, that is, the two-hundred-fortieth scan electrode line or the two-hundred-forty-first scan electrode line by reducing or removing the surplus charged ionizing particles.

In the method for driving a PDP having a structure in which address electrode are divided into two parts according to the present invention, it is also possible to sequentially apply the scan pulse to the first to the two-hundred-fortieth scan electrode lines intersecting the upper address electrode part and sequentially apply the scan pulse to the two-hundred-forty-first to the four-hundred-eightieth scan electrode lines intersecting

the lower address electrode part for odd-numbered or even-numbered sub-fields.

【Effects of the Invention】

According to the present invention, abnormal discharge or dielectric breakdown generated caused by charged ionizing particles accumulated or lost in a region outside a display area can be prevented. Furthermore, the present invention can prevent abnormal discharge or dielectric breakdown generated at the boundary of upper and lower address electrodes in a PDP having a structure in which an address electrode is divided into two parts for dual scanning.

The forgoing embodiments are merely exemplary and are not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.